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Laser Treatment of Facial Scars

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ABSTRACT

Laser treatment of facial scars cannot substitute for optimal initial repair. Nonetheless, laser treatments may serve as valuable adjunct interventions after initial wound healing. Proper classification of scars into atrophic, hypertrophic, and keloid categories enables the appropriate selection of laser modality.

KEYWORDS: Laser, keloid, scar

Laser treatment of facial scars is part of the continuum that encompasses the management of soft tissue facial injuries. This continuum includes the initial repair/reconstruction of the wound, wound care, and treatment of the healing scars. The latter includes laser treatment, topical silicone gel products, and possibly injected therapy, including corticosteroids. This article will focus mainly on laser treatment of the healing wounds.

The process starts when the patient presents with the facial injuries. The initial treatment of these injuries is a critical part of reducing the residual scarring. Laser treatments cannot compensate for inadequate or poor initial treatment.

Initial handling of the traumatized skin and soft tissues includes gentle handling of traumatized tissues and meticulous repair. In traumatic wounds, when using skin sutures, the authors prefer nonreactive monofilament sutures (Fig. 1). The tissues surrounding each wound should be evaluated before initiating the reconstruction. Debridement should be limited to tissue that is extensively crushed and will not recover from the injury. One of the difficult initial decisions is whether and how much to debride when the wound has a significant crush component. Frequently, ecchymotic, mildly crushed soft tissues in the face are viable and will heal uneventfully after repair. Preservation of these

mildly crushed tissues is particularly important when they involve facial landmarks that can be difficult to reconstruct. Nonetheless, if the wound edges are excessively crushed and trimming the crushed wound edges will not create a deformity, then the excessively crushed edges can be judiciously trimmed. This will create fresh wound edges that are more likely to heal with less scarring. There is no rule as to determining how much can be removed for “sculpting”—it is always a judgment call.

Significant tissue defects due to crush or avulsion injuries can be reconstructed using adjacent tissues. For the majority of patients, complex reconstructions, such as flaps or grafts, should be delayed until some healing has occurred. Occasionally, there will be a significant defect (functional and/or cosmetic) or exposure of vulnerable underlying tissues if this is not performed. For example, the authors had a patient in his early twenties who presented acutely after a vehicular accident with loss of ~85% of his upper eyelid skin. For this patient, rather than risk the effects of cicatrix formation and lagophthalmos, the authors placed a full-thickness skin graft as soon as the patient had stabilized from the initial trauma. The graft had a 100% take, and the patient had normal eyelid function. This is important for protecting the globe and avoiding dryness. Another example is some limited full-thickness burns that are well demarcated.

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Figure 1 This patient was riding his bicycle on a grated bridge. He had an accident and landed face first into the metal grates of the bridge. His facial wounds have been debrided, sculptured, and carefully closed using monofilament sutures.

For some patients, a better result can be achieved by immediate excision and reconstruction.

Laser treatment of facial scars should only be considered after the initial healing has occurred. Depending on the wound, the initial healing period can vary. Also, before considering laser treatment of traumatic scars, they should first be classified as hypertrophic, keloid, or atrophic scars. Different laser treatments are used for different types of scars. Hypertrophic scars are thickened, firm scars that are within the borders of the initial wound. If untreated, hypertrophic scars frequently improve over time, although this often requires years. These scars frequently benefit from laser treatments. Keloid scars differ from hypertrophic scars: They are firmer and extend beyond the margins of the original wound. They usually do not improve over time and are more difficult to treat than hypertrophic scars. At one time, there was a general impression that CO₂ laser excision would reduce these scars, but frequently this is not the case. In one study, there was an initial improvement, but when the patients were followed for 12 months, it was found that there was no improvement in these scars.¹ In another study, keloid sternotomy scars improved after treatment with the pulsed dye laser.² Atrophic scars differ from hypertrophic and keloid scars. These scars have depressions that can involve both the skin and soft tissue layers. Loss of supporting soft tissues due to significant soft tissue crush or avulsion in association with the initial trauma can leave a depression with healing. If a laser is used to treat an atrophic scar, it will not improve any underlying soft tissue deficiency.

Hypertrophic scars are the most frequent types of scars that develop after skin and associated soft tissue trauma. In addition to visible thickening, these scars can be pruritic. Current modalities for treatment of hyper-

trophic scars include pulsed-dye laser, 532-nm laser, topical silicone gels or sheeting, and injection of corticosteroids. Although still not regularly used by most physicians, there are a few reports about using intralesional 5-fluorouracil (5-FU) for treatment of scars.³⁻⁶ There have also been multiple reports of using the pulsed-dye laser for treatment of hypertrophic scars.⁷⁻¹⁰ Vascular lasers are now frequently used to treat hypertrophic scars. They can be used to treat both thickening and, for more recent scars, erythema. Pruritus associated with scars can improve after one treatment. Improvement in thickening associated with hypertrophic scars frequently requires at least two to three treatments. The duration of hypertrophic burn scars does not affect the potential results of treatment; in two studies, patients with scars present for periods of months up to 16 years responded to treatment.^{7,9} Therefore, delaying treatment of hypertrophic scars has not been shown to affect the results of treatment.

Because the pulsed-dye laser affects the microvasculature associated with hypertrophic scars,^{8,11,12} the authors prefer to treat the scars when they still have some visible pinkness. Other lasers, such as a 532-nm laser, can be used for treatment of hypertrophic scars, as this also affects the microvasculature (Fig. 2 and Fig. 3). Combining injected corticosteroids with vascular laser treatments does not improve the results of treatment with a vascular laser alone.¹³ When using a pumped-dye laser such as the Vbeam (Candela, Wayland, MA), the authors use the lowest fluence settings that produce a small response. The spray/delay settings can vary.



Figure 2 This patient has developed multiple hypertrophic scars after treatment of facial wounds.



Figure 3 The patient shown in Fig. 2 after the scars were treated with a pulsed-dye laser and with a 532-nm laser with significant improvement in the scars.

The senior author also prefers longer pulse durations such as 6 or 10 seconds. After using this laser with these settings, there will be minimal to no ecchymoses. During the course of treatment, there is a very brief change in color of the treated area, which then returns to its original color while the laser is still firing. This brief color change is so fast that if the physician is not watching closely, it can be missed.

Atrophic scars are more common from facial acne and less common from facial trauma. They can be more resistant to improvement but have been treated with ablative,¹⁴ nonablative,^{15,16} and fractionated lasers¹⁷ with some improvement. The authors are continuing studies for optimizing the results of treatment of atrophic scars with fractionated lasers.

CONCLUSION

Minimizing scars from more extensive traumatic facial skin and soft tissue injuries can require multiple procedures and modalities. Each intervention is important for achieving the optimal result. Vascular lasers can be used to improve hypertrophic scars and have been shown to improve the scars even when used in a delayed fashion after the injury.

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